

# Some Selective Logging Techniques And Guides\* Practiced In The Nasipit Lumber Company

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It is believed that the success of the government's program on selective logging depends largely upon our ability to introduce logging techniques that are conducive to the saving of more adequate number of uninjured residual trees in the logged-over area. The early return of logging operators to the same area they have operated depends largely upon the adequacy of these trees saved from destruction and injuries in the course of logging operations. It would, therefore, be necessary to control the operation of these logging operators by introducing logging techniques that will minimize or prevent the cutting, injuring or destroying of these trees, both large and small, which must remain to insure the continuity of production.

## 1. SPAR TREE

Spar trees properly located is considered one of the important functions of tree markers, and much so, on the part of the company's survey crew or the logging foreman. On it depends the location of planned cableways and the number and condition of residual trees. A coordination and consultation with the survey crew and logging foreman should be resorted to by tree markers so as to properly locate these spar trees. Some pointers for a correct location of spar trees are the following:

(1) It must be on the highest point in the

set-up where at least two or more gullies, creeks and the ridges run towards it or emanates from it. Observation shows that on the highest point or top of hill in settings, there emanates from it creeks, gullies or ridges. Hence, these creeks, gullies or ridges will serve as main cableways. Another reason is that skidding of logs from the felling areas will have the principle of the "fishing rod" or yarding will be in the "uphill procedure". Logs being yarded uphill are easier to control than logs yarded downhill. The saving of more residual trees will be in our favor when yarding under this condition.

(2) It must be centrally located in the setting so that all trees felled and bucked could be yarded. It is not a good policy to have trees felled and bucked and then not yarded, because it is against the policy of closer utilization.

## 2. TREE MARKING PROCEDURES

For the purposes of having closer control of cutting or on the operation, marking of trees by designating individual trees that are to be left and to be cut are conducted. Tree marking is done by trained forest officers with the help of licensee's or company's forestry crew. It is guided by the minimum requirements of residual stand.

### A. Marking Trees to be Cut

A new method conducted in Agusan that was not practiced in Basilan before is the

\* The logging techniques described here had been demonstrated in a work shop-seminar conducted by Forester Eulogio Tagudar and the timber management staff in Agusan under the supervision of District Forester Vicente Marababol and direction by Forestry Supervisor II Martin R. Reyes of the Forest Management Division, in April and May, 1957. These are now regular practices in Nasipit Lumber Company. They are recommended for application by other logging companies in accordance with the selective logging program under Forestry Administrative Order No. 23, dated October 14, 1954.—BU-REAU OF FORESTRY.

marking of trees to be cut, as well as specifically marking its direction of fall where it will cause the least damage to the marked residual trees. This method was adopted as a result of months of observations and studies of actual felling operations. The purpose is multiple: first, it is to reduce damage in the course of felling; second, it will be used as a basis in determining regulatory fines against the company for injuries or damages on marked trees to be left due to carelessness of fallers in not following the direction of fall as indicated by the mark on the stump of the tree; third, it will simplify marking trees to be left because all unexploitable trees marked with "X" will not be marked by forest officers or the company crew and it is also a means of preventing fallers from felling on top of the other felled trees. The latter method done by fallers facilitates bucking but it causes breakages, splits and checks on the logs.

**Procedure.** — Markers of trees to be cut consist of two members. One member, who is usually the leader, selects the trees to be cut; estimates the heights of the tree and widths of the crown; determines the range or direction within which the tree is to fall; reconnoiters places where it will cause the least damage to the marked residual trees and shouts or signals the painter where the tree is to be felled. As soon as the exact place for the direction of fall is determined by the leader, the other member strikes his marking gun stick to the tree and adjust its sight to the direction where the tree is to be felled. He then paints the T-square. The leader marks a residual tree that will be destroyed or damaged with "X". He (leader) moves to the next tree and the other member follows him.

Trees designated to be cut but will be used as rub trees are marked with a star "\*" to indicate that the same should not be cut by the fallers until they have served the purpose. However, the tree marker and the yarding crew must exert efforts to look for non-dipterocarp trees to be used as rub trees.

The direction of fall can be determined on

four conditions of standing trees enumerated as follows:

1. Straight and evenly-crowned trees that can be felled in any direction on a windless day.

2. Leaning trees that can be felled against their leans on either side of the tree within a quarter-circle.

3. Leaning trees that can be felled in the direction of its lean.

4. Heavily branched or forked trees on one side that can be felled in any direction within a quarter-circle on either side of the tree.

In placing the mark for the direction of fall of the above classes of standing trees to be felled, it should be in the direction where it will cause the least damage or no damage at all to the marked residual trees or clumps of seedlings, saplings and poles. All efforts should be exerted to study and determine the position of the lean of the tree as well as the arc or range wherein possible falling could be done without the use of the felling wedge or its use (felling wedge) could be minimized in each setting.

#### *Pointers in Determining the Direction of Fall.*

— Fallers are the key to the efficient leaving of more healthy residual trees in the logged-over areas. Hence, they should keep in mind the following pointers:

1. Always follow the mark in the direction of fall of trees to be cut.
2. If the trees to be cut are not marked in licensed areas or if marked but some direction of fall are found to be faulty, the following should be considered:
  - a. Fall trees, where possible, to avoid injury and knocking trees marked to be left and clumps of young forest growths such as red lauan, tangile, white lauan, almon, mayapis, apitong and bagtikan.
3. In high-lead settings, trees should be felled downhill or diagonally to the contours (preferably toward the spar tree) and accessible to yarding cables in the creek and gully bottoms to prevent too much sweep of logs felled as to knock standing trees. Creeks and

gully bottoms, if they originate from spar trees, shall serve as cableways. As much as possible, in other cable roads, should the position of standing trees warrant, trees should be felled parallel or diagonal to said cableways.

4. In tractor settings, if standing trees warrant, felling of trees to be cut should be perpendicular or diagonal to pre-laid main or secondary tractor roads. This method will facilitate the pulling out of logs to the tractor roads without entering areas between the roads and avoid si-washing around or sweeping down residual or groups of young trees.
5. If it is impossible not to hit marked trees try to fall only one marked tree without entering areas between the but not to groups of clumps of marked trees, but it should be compensated by a better looking tree among those marked "X".
6. Before felling a tree, fallers should scout or reconnoiter the location of marked trees to remain, then the direction of fall is decided to prevent damages to those marked trees.
7. Fall trees away from a clump of trees to be marked as residuals or where it will cause the least damage.
8. Fall trees towards or away from the spar tree or diagonal to the runway of the main yarding cable.
9. Prevent the felling of trees on top of other trees.
10. Trees shall be felled in such a way that it will not hit a nearby stump or fell across gully to avoid breakage.

#### **B. MARKING TREES TO BE LEFT**

Although we are at present marking the trees to be cut, we do not abandon marking trees to be left for the following reasons: (1) to familiarize fallers and yarders on the kind of trees we want to be saved and (2) to determine the number of residual trees damaged by fallers and yarders so that the amount of fines could be easily computed on the marked trees that were destroyed. Besides, during yarding, in either high-lead or tractor settings, yarders could still look out for the marked residuals. Trees to be left are painted with numbers below sawcut line with horizontal band on both sides of the number. The marks placed on the residual trees could be

readily seen at a distance, thereby alerting fallers to be cautious in felling and yarding operations.

Determining the minimum requirements of residual stand to be left with our goal of about 60% of the number of trees in 20 to 70-centimeter diameter group, in the proportion that the stand of the dipterocarp forest will allow, is done by sampling estimates by the circular plot method. (See attached Table I). About 20% to 30% in the 70 cm. class are only marked when necessary. If the above conditions do not work in settings where the trees are predominantly in the exploitable or mature and over-mature diameter classes and where the lower diameter groups are too few in number, we resort to the marking of all unexploitable trees that are believed to be saved during logging, most if not all of the 70 cm. class trees and some of the 80 centimeter diameter trees as residual growing stock and for seed tree purposes. The last method shall constitute about 40% of the entire stand. After the minimum requirement is determined, tree marking in a particular setting is started, having always in mind the following guides:

1. Staking of proposed cableways shall be done before marking in high-lead settings so that trees desired to be left in these planned cableways shall not be marked.
2. In high-lead settings, tops and sides of ridges, especially if the ridges originate from the spar trees, marking of residual trees is heavily done.
3. On creek and gully bottoms to be used as main cable roads, marking of trees is minimized or nil.
4. In planned cableways other than creek and gully bottoms trees need not be marked. The width of these cableways shall be kept to the minimum necessary for the passage of end-choked logs during yarding.
5. In tractor settings, trees to be left should be confined between proposed skidding trails.
6. Under the coverage of the fall of big trees, no residual trees shall be marked.
7. Within roadways of main and spur roads no trees will be marked.
8. Within 35 to 40-meter radius of spar trees, no marking shall be conducted.
9. In high-lead settings select 3 or 4 "Seed Trees" equidistant from each

other on the outer periphery of the log landing just immediately beyond the guyline area and shall be near the right-of-way of the main cable to assure natural regeneration of the clear-area around the spar tree. Cut all vines twining around trees marked to be left.

#### **D. OTHER TREE MARKING RULES**

1. Trees to be marked are Philippine Mahogany species, apitong and other commercial species commonly sawn.
2. All the trees marked in each set-up are intended to be left uninjured. Allowance had already been given for logging damages during the marking. However, there are cases where a tree marked to be left cannot be avoided, so if it is impossible not to damage it, it should be compensated for by an unmarked or undesignated tree to be cut provided that the compensating tree is more or less the same as the tree to be damaged.

#### **3. FELLING TECHNIQUES**

Felling damages to the residual stand is quite big. Studies conducted in Basilan and Agusan shows that as much as 10 to 15% or sometimes more of the entire stand in a setting is damaged in felling. The wounding of residual trees caused by the lodging or crushing of unmerchantable or miscellaneous species and by trees to be cut, is another form of injury.

However, a great many of the trees marked to be left can be saved during the course of felling by exercising more care in felling the trees and the use of felling wedges. The pressure exerted by a wedge driven in the sawcut by blows from a sledge hammer is so tremendous that even very large trees can be forced to fall against their natural leans by judicious wedging. The use of this tool plays an important role in the saving of more residual trees during felling. In this company (NALCO), the use of felling wedges is strictly enforced. Each pair of fallers is required to carry 2 wedges and sledge hammer every working day. Failure to bring them means no work for the day. The Logging Superintendent and the Bull Bucker see to it that all fallers are provided with these necessary tools.

Discussed hereunder are procedures in felling four different classes of standing trees to be cut.

#### **A. Felling a Leaning Tree Against the Lean**

In felling trees of this type, a shallow undercut is preferable. This is to prevent big splits of the butt logs and premature felling of the tree. After several factors have been weighed and decided on where to fall the trees, and after taking into consideration the places of marked residuals or by following the mark as indicated in the tree, as done in this company, the undercut is sawed horizontally to the depth of about 1/5 to 1/3 of the diameter of the tree and then chopped by an ax to the end of the sawcut forming a diagonal opening of about 45 degrees with the bottom of the sawcut. After the undercut is finished, the backcut or felling cut is sawed off at an angle to the undercut not parallel to it as in the felling of erect and evenly-crowned trees. In this method of sawing the backcut, one side will already be completed while the opposite side is still partially cut. As soon as the fallers know that the tree starts to fall, they rapidly complete the backcut while the partially cut side or unsevered side hold and pulls the tree to the side against the lean. Such trees when felled against their leans can be "pulled" away from their leans by leaving a wider band of uncut wood on the side where the direction of fall is desired. This uncut section acts as a hinge that will throw the tree to a desired direction to avoid hitting marked residual trees or clumps of dipterocarp trees. Under some cases, however, wedges are necessary to prevent the saw from being pinched in or to help direct the fall of the tree at open places or where damages to the residual stand will be least caused. Please see illustration on the procedure of felling this kind of tree. Figure 1.

#### **B. Felling a Leaning Tree in The Direction of its Lean**

In felling leaning trees in the direction of their lean or natural "pull", the undercut is usually deeper than for straight and leaning trees to be felled other than their leans. This is necessary to prevent premature felling of the tree before the backcut has been severed off sufficiently and to prevent splitting of the butt logs. Corner notches are usually chopped on each side of the undercut in these trees to prevent pulling side splinters as the tree falls. The procedure in felling this tree is the same as in felling an erect and evenly crowned tree. Illustration for corner notches is shown in Figure 2.

### *C. Felling Trees Heavily Branched or with Forked Branches on one side*

Trees heavily branched or with forked branches on one side can be felled, like leaning trees, in any direction within a quarter-circle on either side of the tree to avoid injury or destruction to marked residual trees or groups of dipterocarp seedling saplings and poles. See illustration, Figure 3 on the method of felling trees within a quarter-circle on either side of the tree.

### *D. Felling an erect and evenly balanced crowned tree*

A straight or an erect and evenly balanced-crowned tree, in a windless day, can be felled in any direction to avoid injuries to the residual stand. If it is properly undercut and backcut, even without the use of felling wedges, it could be felled squarely in the direction of the undercut. After locating the places of marked residual trees or following the mark on these trees to be cut and taking into consideration that this tree will not break when felled, the undercut is sawed and chopped. The backcut or felling cut, which is about 1 to 4 inches above the bottom of the undercut, is sawed on the opposite side of the tree by a felling saw and it advances in a parallel direction to the undercut until a small uncut wood section for holding breaks off. As this (uncut wood for holding) breaks off, the tree falls and settles. In an erect and evenly balanced tree, the uncut section has a uniform width from side to side not like leaning trees felled against their leans which is wedged or angled shaped. Please see illustration Figure 3-a on the method of felling this particular kind of tree.

## **4. HIGH-LEAD YARDING TECHNIQUES AND PROCEDURES**

Moving logs from points in the felling and bucking areas to landing or points of destination is done by power units. In high-lead yarding, the principle involved is the attaching of the logs to a stationary power unit pulling the log to it by means of cables reeled in by a drum, like the cable yarders. Because of the strength and speed of cable lines during yarding all trees uncut along its path are knocked down, broken or seriously damaged. These damages, however, could be kept at minimum by the proper choice of yarding equipment and application of logging techniques and effective supervision of the work.

### *A. Si-Washing Block Combined with Si-Wash Trees*

"Si-Wash Block", also called "flying dutchman", when combined with si-wash trees is an effective method of saving young trees during the course of yarding on hill sides and promontory ridges. The use of this method of yarding is motivated by the desire of both the Government and the company to save marked residual trees on hill sides, specially on sloping grounds where a pull of gravity augmented by jerking and fast reeling in of the main line operate. Hence, to counteract or control the downward play of logs, the si-wash block rigged between the spar tree and butt rigging assembly within the guy line area (fig. 4) or any point between the lead tree and the haulback block (fig. 5), overcomes some of the gravitational forces and guides the main line to a more or less favorable or controllable yarding cableway and minimizes the too-much play of logs yarded on this topography. The si-wash block, having a special groove to fit 1-1/2 or 1-1/4 inches cable lines and has a wide throat to pass butt riggings should be used. This block is hitched to a stump with 1-1/4 or 1-1/2 inches wire rope strap about 140 to 150 feet away from the spar tree. At about the middle or at the strategic places along the half moon's loop, si-wash trees are used as a combination with the block which bends further the main line thereby plays a vital role in avoiding injuries or destructions to groups of residual trees along the slope. The si-wash trees are chosen at strategic places above or below the group of residual trees so that logs being hauled in could do the least damage or none at all to these trees. Although si-wash trees are not as effective as the bullblock in saving residual trees on promontory ridges and hill sides, it still could serve the purpose.

### *B. Slowing Down of Main Line*

Fast and jerky pull of the mainline during the yarding operation is one of the main causes why residuals are uprooted, broken and seriously injured along cableways. To prevent the occurrence of such damages on these trees in this method of yarding, the main cable line should be slowed down as soon as it passes beside or through residuals or should be stopped about 3 to 5 meters or more when "logchaser" believes that the residuals are in danger of being damaged. The precautionary distance is such as that an allowance could be given for delayed relay of yarding codes from the hook tenders to the whistle punk

to the engine operator, and much more so on the pulling momentum of the log even after a brake had been applied to the engine.

When a hang-up is sure to happen on a residual, the precautionary distance and stop are observed. And then followed by the placement of the end of the log in such a way that it will turn around and miss the residual when the line is pulled. It is regrettable to state that some men are lazy or have the tendency to follow the log being yarded only either by sight or following it within seeing distance even on flat terrains. In rugged terrains where following a log is tiresome, log chasers should post or station themselves on strategic places where they are within reach for possible hang-ups both on residual or obstacle. It is believed that only through constant lookout of the running log by the "chokerman" can they relay efficiently signals to slow or stop the main cable line upon reaching a residual tree most likely to be injured by the log.

### *C. Extension Chokers*

To reduce the number of cableways in a setting in yarding logs in any terrain, extension chokers should be used to reach one or more isolated logs felled between major cableways. It is our belief that the less the cableways in any setting the less is the destruction to the residual stand. The extension chokers mentioned herein are addition or joining of 2 or more chokers, usually a combination of 3 chokers with varying lengths of 35 to 60 feet. In an ordinary high-lead yarding, only one choker is attached to the butt rigging assembly. To reach one or more isolated logs between major cableways, one or more chokers are joined together. When the log reaches about 1 to 2 meters to the cableways, the main line is stopped and the first two chokers (if 3 chokers are used) are detached from the butt chain hook and the last choker tied to the log is hooked and the main line is again reeled in. Rub trees of non-commercial species must, however, be used to direct the logs away thus shielding residual crop trees along the chokers from being swept down or severely injured. See illustrations, Figure 6.

### *D. Log Guides*

In skidding or yarding logs on promontory ridges and hill sides with or without the use of bullblocks, si-wash blocks and extension chokers, logs shall be strategically post-

ed along cableways on slopes or places in front on the cable side of marked trees on level areas and slopes. (Fig. 7). When all the logs in this loop are yarded to the landing, the logs used as guides should be yarded consecutively from the far end to the landing. A log guide can be moved away from a saved residual by chokers and rear or opposite side stump (or non-commercial tree) combination to deviate the log from the saved residuals and placing said log in the middle of the main cableway.

### *E. Maximum Yarding Distance*

The maximum yarding distance recommended to be followed for highlead yarding shall, as much as possible, be limited only to a radius of 900 feet. Only under extreme circumstances may yarding distance of 900 feet be allowed. Observation and study show that the longer the hauling distance the more destruction to the residual stand and the more uncontrollable will be the main cable line. The damages or destruction such as uprooting of marked trees, sweeping down of forest growth, breaking of branches and scraping of barks of trees are caused by excessive play of the main cable during yarding due to the looseness of the main cable line. Keeping the 900 feet yarding distance may reduce the fear of the yarding crew in not producing their quota for each day because the longer the hauling distance the slower the movements of logs from the felled areas to landing especially if the main line traverses across creeks and ridges.

As regards the maximum distance in tractor yarding, this will be governed on how the individual operation considers his own economic distances, relative to the conservation program to be attained, as each logging show presents variable problems to the logger.

## **5. TRACTOR YARDING TECHNIQUES**

Skidding logs by tractors equipped with winches and logging arches either the crawlers or rubber-tired (sulky) type is another method of moving logs from the felling areas

to the landing. The principle involved is the attaching of the logs to the mobile power unit and the power unit and the logs move to the landing. During this process, tractors with or without load when going back and forth (from the landing to the felling areas) will likely cause injury or will injure residual trees, especially when done during the rainy season. Changes of tractor roads during this period usually occur because after 3 or more passes of the tractors with and without load on same place, they dig deep into the soil and are stucked up. Sources of injuries or damages in tractor yarding are done by the bulldozer's blade, load (logs) and the tractor wheels. At times injuries in tractor settings are mostly done by careless tractor operators. Because of the human desire to produce more logs per day (tractor operators are paid by contract on the amount of logs they could put out each day), little initiative is used by these operators to protect the marked residual trees.

Discussed hereunder are techniques in tractor yarding which are believed when practiced intensively to minimize damages to the residual stand within reasonable limits.

#### *A. Laying Out Tractor Roads Before Felling And Yarding*

Before felling and yarding operations were conducted, skidding trails and back trip trails (tractor roads) were established. See attached sketch Figure 8, for proper laying out tractor roads. In level areas, tractor roads were established as straight as possible by bulldozing them, yet avoiding groups of residual trees and forest growths. In rolling areas, skidding roads may follow top of ridges and gullies (if dry season) and secondary skid roads may branch out at 45 degrees to the main skid roads.

#### *B. Felling Trees in Tractor Setting*

Felling trees in this tractor set-ups should be done, if position of standing trees warrants, perpendicular or diagonal to the tractor roads. Sometimes trees are felled to fall along the

roads to avoid further damage of residual trees inside the loop. This facilitates the pulling out of logs to the tractor roads and avoid si-washing around or sweeping down marked residual trees or groups of young trees.

#### *C. Skidding Procedure in Tractor Settings*

In skidding logs between those established tractor roads, tractor operators should first clear the tractor roads by the use of the bulldozer's blade on the side of the logs where no marked residual trees will be destroyed. Later he backs up to the load (logs). Logs from inside or between secondary roads shall be pulled out by cable to the road with the tractor stationary at the road. The operator should pull out the top or butt logs to the side of the next log and so on, and then tractor and logs moved to the skid roads and to the landing. Pulling out two logs cut from the same tree is permitted on open spaces where no residual trees will be destroyed. Skidding shall be confined to the skidding trails and backtrip trails. Tractor operators should not make short cuts to the landing nor should they change skid roads as often as they please. Pulling should be done endwise not sidewise. The latter, hooking two logs cut from the same tree at the same time, is destructive. Tractor operators should back up only on tractor roads and open spaces. During rainy season, only crawler-wheeled logging arches should be used as they are more floatable than rubber-tired logging arches. If the main or center tractor road becomes impassable, the secondary tractor roads should be used and not just any place the driver may choose.

#### *6. GUIDES FOR THE COMPANY'S SURVEY CREW*

1. Location of spar trees should be a coordinated task between the company's survey crew and the management officer of the Bureau of Forestry.
2. Spar trees should be located on top of hills or spot in the setting where two or more creeks, gullies or ridges emanate

- from it. Creek and gully bottoms will then be used as main cable ways in yarding.
3. Locate boundaries of settings, where possible so as not to yard across ridges. These ridges should not, if crossed, be higher than the base of the spar tree.
  4. Boundaries of setting should include natural features such as, creeks, gullies, and ridges, provided the trees to be felled will slide down to creeks, and gullies, that could be reached by the yarding cables and favorable to yarding.
  5. The radius of boundaries of settings should be limited only to the standard length of 900 feet and not over to avoid a loose and playful main cable line during actual yarding.
  6. Boundaries of settings should be painted with any visible color to guide fallers, yarders, B.F. and company crews.
  7. Survey lines for road location should be clearly laid out and visible on the ground by stakes properly labeled as main haul road, spur road, skyline and donkey trail, and others.

#### 7. GUIDES FOR ROAD CONSTRUCTION CREW

1. Road rights-of-way for main haul road should only be 30 meters wide, that is, 15 meters on both sides of the road, reckoned from the center. Clear cutting will be allowed only within the roadway. There should at least be 2 healthy residual trees or more within every 50 meters along each side the road, so that on a per hectare basis, at least there will be left about 25 trees per hectare.
2. For spur road rights-of-way, only 10 meters wide shall be allowed, that is, 5 meters on each side from the center of the road. At least 1 or more healthy residuals shall be left within every 50 meters.
3. No poles of the dipterocarp species shall be cut to be used for corduroys, except those allowed in 1 & 2 above, within the rights-of-ways, alienable and disposable areas and those unintentionally damaged during logging.
4. Bulldozer operator should not dump scraped earth on the base of residuals along the spur line or main haul road to prevent it from being killed by air suffocation.
5. Follow strictly cut-line as laid out by the survey party to avoid damages on trees marked to be left beyond the road way of the proposed road.

#### 8. RESIDUAL INVENTORY

After each set-up is logged, all efforts should be exerted to have them inventoried so that the remaining growing stock could be determined, to know if improvements of logging techniques should be done and if the number of remaining healthy residual trees will be sufficient for the next cut. For the purpose of recording the residual trees, the marking record previously used should be used. The criteria to be followed are:

- A. Criteria for Healthy or Standard Residual Trees:
  1. No damage sustained on all previously marked and unmarked unexploitable dipterocarp trees having escaped injury during logging.
  2. Not more than 1/6 of the crown that is, if 1/5 of the crown is injured it will be considered not healthy.
  3. Any injury on the trunk reaching the wood (beneath the cambium) should not be more than 5 centimeters wide and 50 centimeters line parallel to the longitudinal axis of the trunk.
  4. Not more than 1/3 of the buttress is badly battered.
  5. Not more than 1/2 of the circumference at any place on the trunk is girdled and deeply indented by wire rope.
  6. Not more than 1/6 of the root system is removed or disturbed.
- B. Doubtful or Substandard Residual:
 

The injury shall be:

  2. More than 1/6 to not more than



1/2 of the crown is injured or removed.

2. Any injury on the trunk reaching the wood, over 5 centimeters wide to 1/3 of the circumference and not more than 2 meters long along a straight line parallel to or along the longitudinal axis of the trunk.
3. More than 1/2 but not more than 2/3 of the circumference of the trunk is girdled or seriously indented by wire rope.
4. Over 1/3 but not more than 1/2 of the number of buttresses are battered.
5. Over 1/6 but not more than 1/4 of the root system is removed or disturbed.

## 9. PREPARATION OF TREE MARKING AND INVENTORY REPORTS

### A. Tree Marking Report

Preparation of this report consists of a stand and stock table patterned after the present standard procedure of preparing timber valuation tables for forest reconnaissance and inventory reports for each setting. Briefly, it is by diameter classes at 10 centimeters interval and by species. Below the total is the computed total per hectare of the number and volume of the trees of each diameter class.

### B. Residual Inventory Report

Preparation of this report consists also of a stand and stock table for each setting of the healthy residual trees and doubtful or substandard residual trees. A separate report should be made for the summary of the healthy residual trees. If time is not available, only the report for the healthy or standard residuals inventoried should be reported and forwarded to Manila unless the other is called for. To make this report simple and easy to prepare, compute the total per hectare for each diameter classes by dividing the total number and volume of the trees in each diameter class group by the area of the setting. It is not necessary to compute

the per hectare basis of each species, unless called for.

Computation for the tree marking, residual inventory, original stand and other data should always be done on per hectare basis for simplicity and ease of comparison.

## 10. REFORESTATION WORK

(in connection with selective logging)

On bare areas around spar trees and cableways, dipterocarp wildlings should be planted. The semi-balled method of transplanting should be done. Planting stock should be taken from the nearby areas around spar trees to avoid long exposures and disturbances of the root system. The method is easy and simple. Just thrust the spade at four or more different places around the wildlings chosen to be transplanted and then lift the soil together with the wildlings. See to it that the root system are not disturbed and the soil around the wildling intact. This method of reforestating bare areas around the spar trees and cableways in Basilan was found to be successful. It is believed that this may also be successful in Tuñgao.

## 11. OTHER CONSIDERATIONS:

Selective logging desires to minimize if not eliminate logging destruction. It is, therefore, normal and advisable to discover other ways and means to improve present logging techniques. It must be borne in mind that it must be simple and practical and not a business loss, yet the object of saving an adequate residual stand is not hampered. Our guiding motto should be "more production but less destruction."

1. Locating planned cableways should be simplified so that even by mere reconnaissance of settings by noting positions or direction of creeks, gullies, ridges and position and location of standing trees to be cut and trees to be left in relation to the spar tree, the proposed cableways could be determined. In determining the possible location of cableways, we must base it on the theory that wherever the logs are, there the cableways will pass.

2. There should be developed a method of establishing tractor roads in tractor settings, like the procedure in establishing boundaries of high-lead settings that could be easily established by company survey crew or could be followed by the yarding foreman. Some sort of tractor roads as simple and straight as possible yet avoiding clumps of marked residuals, such as, the "leaf-vein" or straight formation of tractor roads (not winding roads) may be the most feasible.

3. If the crew and B.F. personnel have time, specially if the marking is well in advance, girdling of big miscellaneous species and other uncut-badly-defective dipterocarp trees should be conducted. Painting of injured portion of healthy residuals with tar

or wood paint to minimize the invasion of wood destroying fungi and insects should be conducted.

4. Gathering data and studies on taper and actual merchantable length of dipterocarp to revise the present inventory or valuation table which disregard more than 5 log length should be conducted to improve accuracy of estimates in tree marking and residual inventory.

**REFERENCES:**

Serevo, T. S. & M. R. Reyes. 1957. The implementation of selective logging. *Forestry Leaves* Vol. II Nos. 3 & 4.  
 Wackerman, A. E. 1949. **HARVESTING TIMBER CROPS**. 1st. ed. McGraw-Hill Co., Inc. New York.  
 Bureau of Forestry. Various instructions on selective logging.

**Table I.—Determination of the minimum requirement of number of trees to be marked to be left in a set-up. (Data is taken from average of 3 or more samplings of 18-meter radius, each .1 Ha. To convert to per hectare basis, move the decimal point one place to the right, as was done to get the figures under Col. (3) of the following table):**

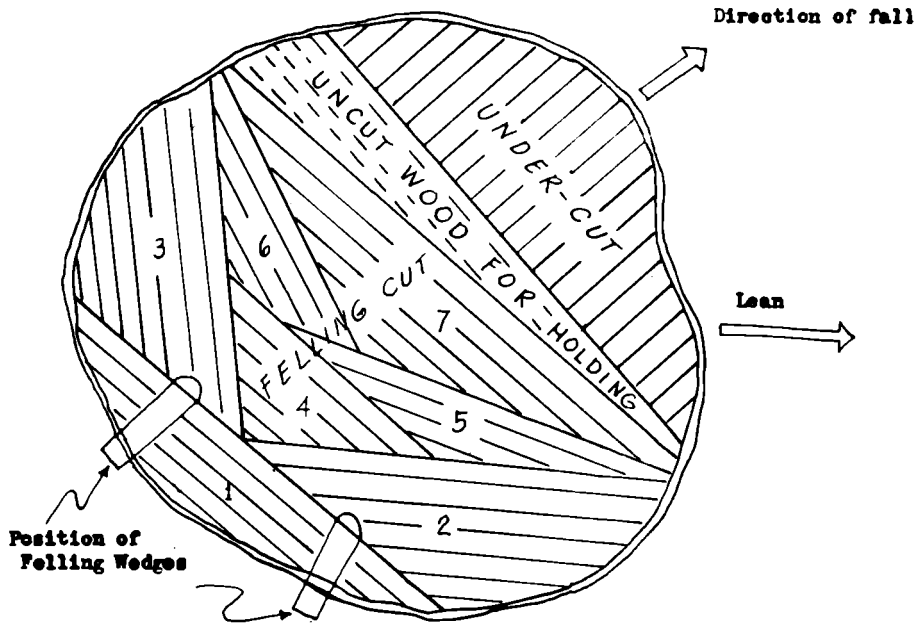
Dia. classes in cms.	Average number of trees per hectare	60% of total Number of trees	Trees to be marked per hectare (Number rounded)
20	3	1.8	2
30	7	4.2	4
40	4	2.4	2
50	8	4.8	5
60	7	4.2	4
70	5	3.0	3
<b>Total</b>	<b>34</b>	<b>20.4</b>	<b>20</b>

Computation for number of trees to be marked to be left in the set-up:

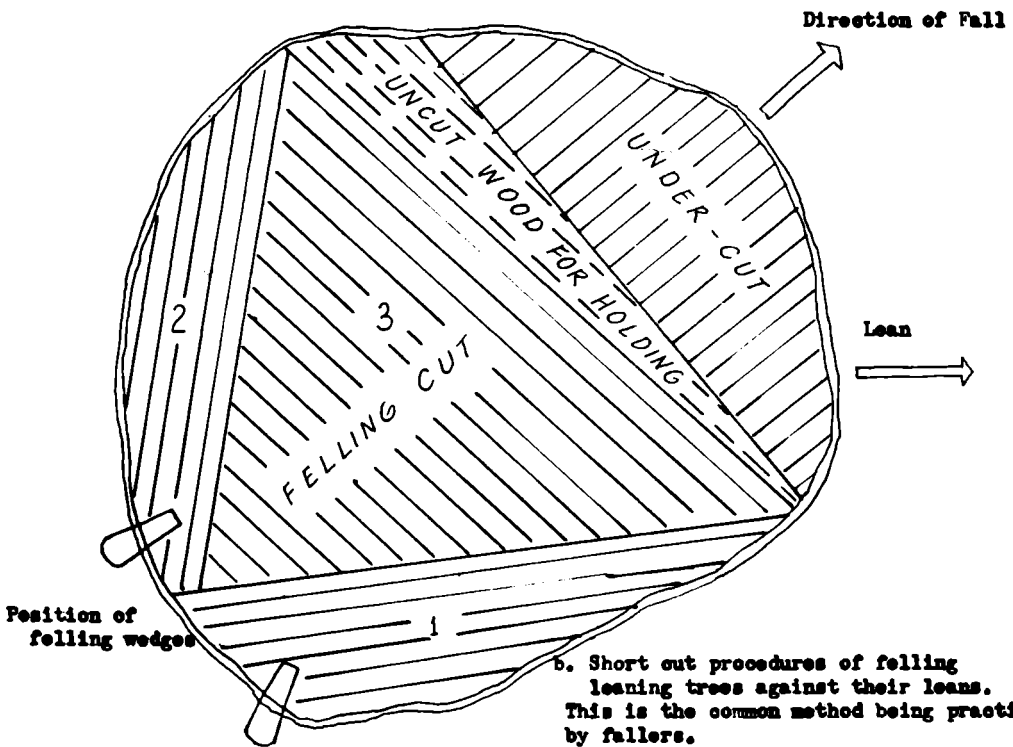
1. Area: 15 hectares
2. 60% of 34 trees (34 x .60) = 20.4 trees
3. Total number of trees: 20.4 x 15 = 306 trees

NOTE: For facility in marking, just take 60% of the total number of trees in the 20-70 cm. diameter class group for goal in marking.

<p style="text-align: center;"><i>Compliments of</i></p> <p style="text-align: center;"><b>Claudio Azcarraga</b></p> <p style="text-align: center;"><i>Timber, firewood and charcoal licensee</i></p> <p style="text-align: center;">General Nakar &amp; Infanta, Quezon</p>	<p style="text-align: center;"><i>Compliments of</i></p> <p style="text-align: center;"><b>Ester C. Utulo</b></p> <p style="text-align: center;"><i>Almaciga Concessionaire</i></p> <p style="text-align: center;">Gen. Nakar, Quezon</p>
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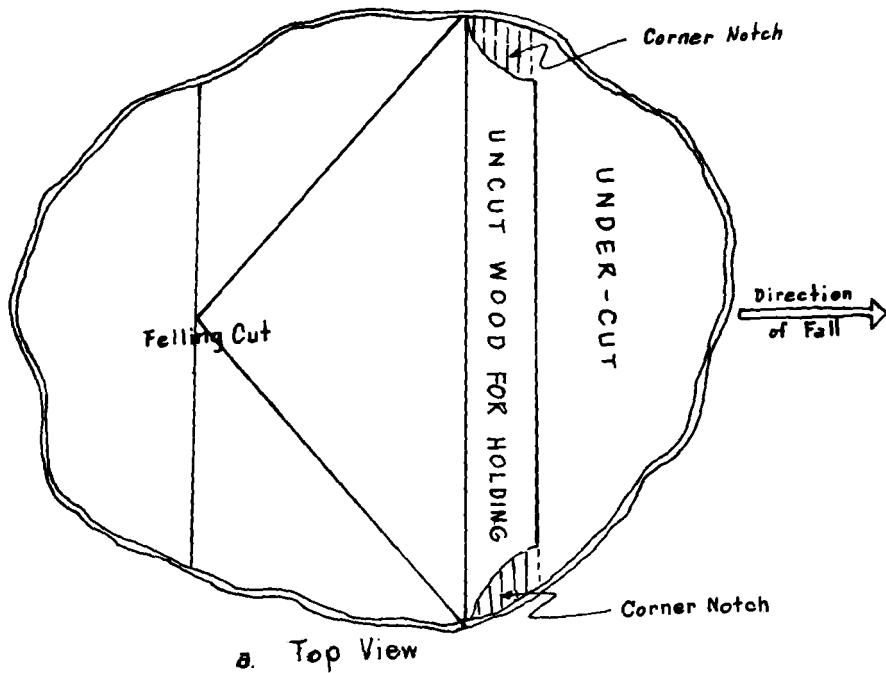


a. Detailed procedures of felling leaning trees against their leans.

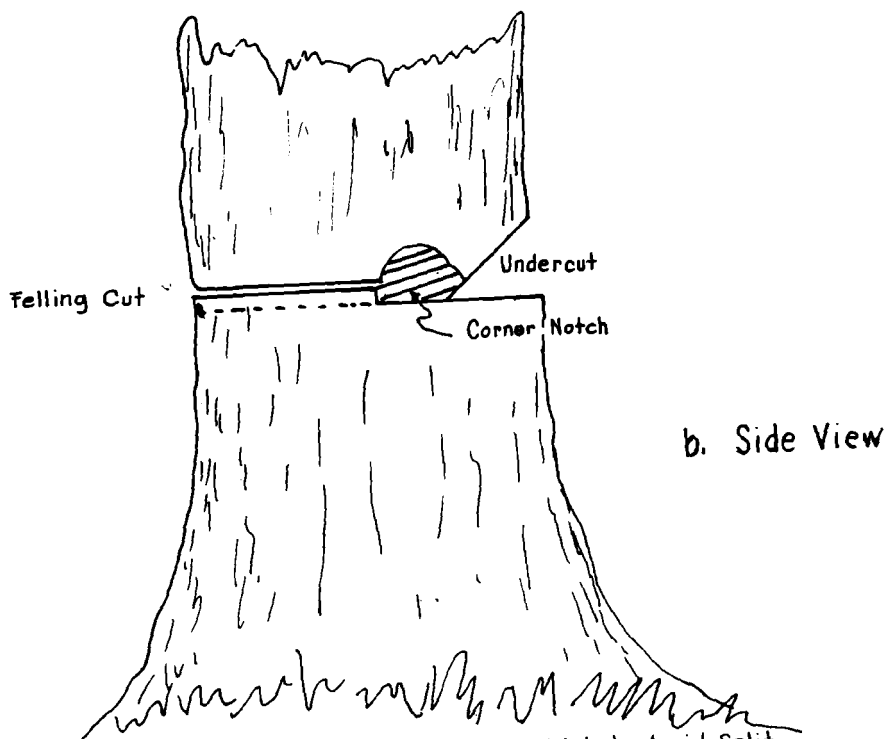


b. Short cut procedures of felling leaning trees against their leans. This is the common method being practiced by fallers.

Figure 1- Procedure in Felling Leaning Trees against their leans.



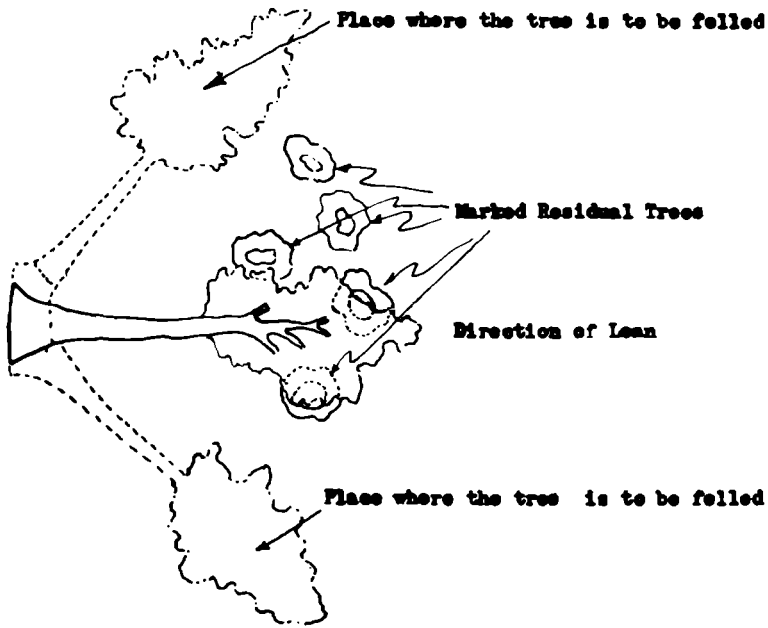
a. Top View



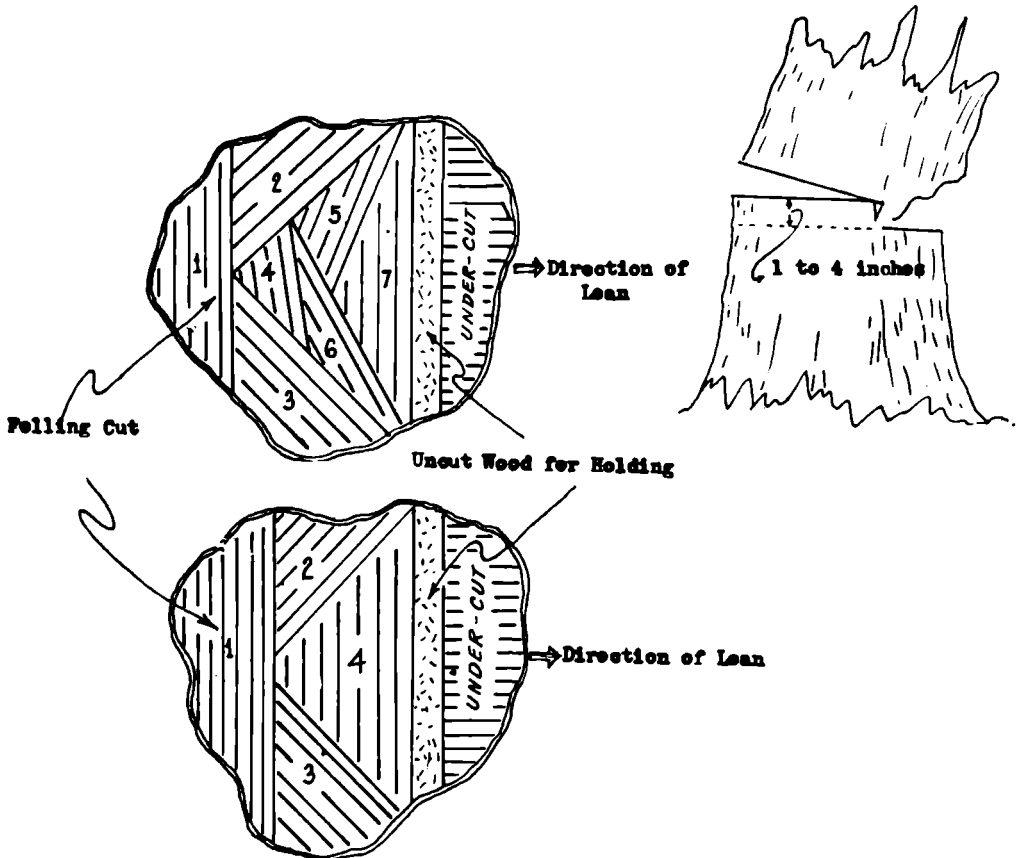
b. Side View

Figure 2 - Making Corner Notch to Avoid Split.

**Felling Technique  
for saving Residuals**



**Figure 3 - Illustration showing felling Leaning Trees within a Quarter-Circle on either side of the tree.**



**Figure 3-a - Procedure in Felling Erect and Evenly-Balanced Tree.**

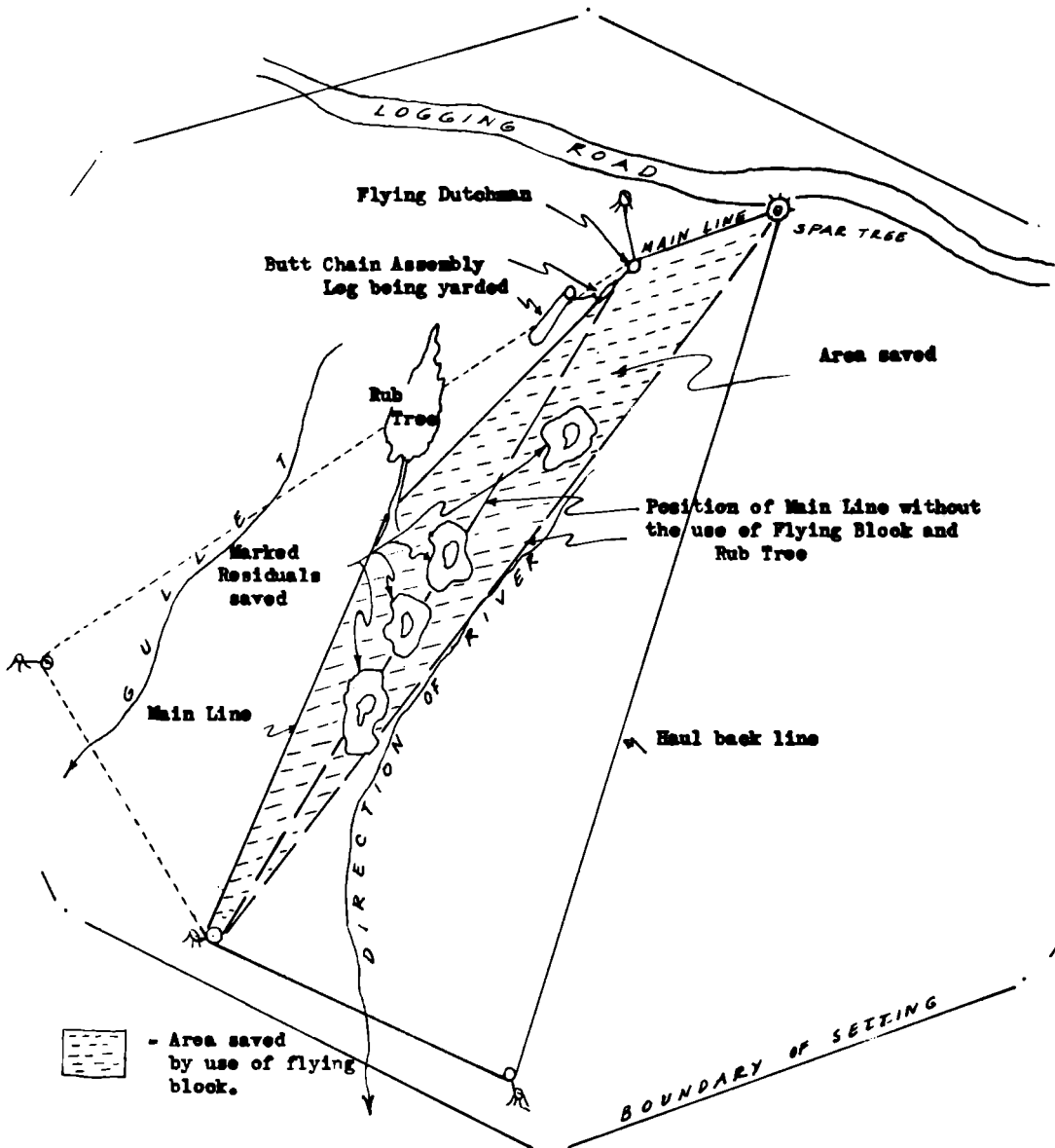
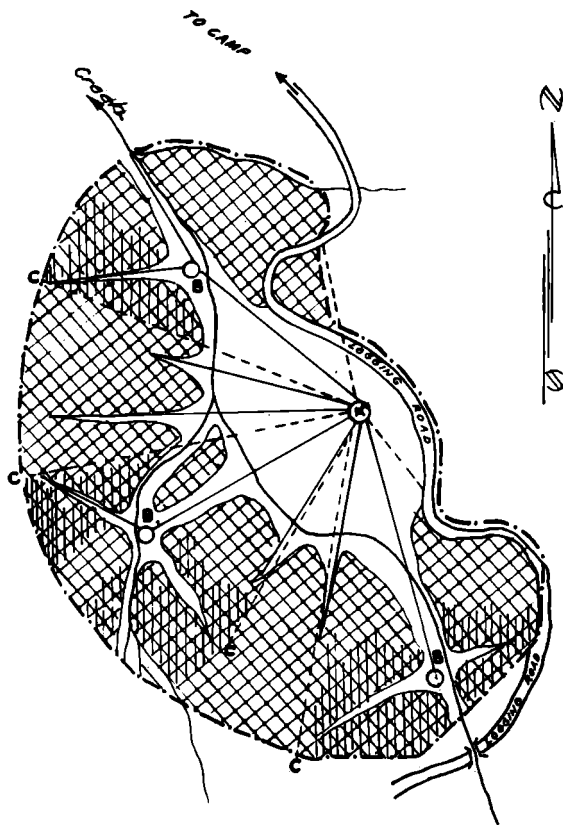


Figure 4.- "FLYING BLOCK" or "FLYING DUTCHMAN":

A yarding technique to save healthy residuals from destruction or injury.



**LEGEND**

- - Location of Bullblock
- ⊗ - " " Spar Tree
- - - - Cable Roads
- - - - Boundary of Set-Up
- - - -
- ▨ - Undamaged Portion
- - Damaged Portion
- ▩ - Portion that might have been damaged if bull-block was not used

Figure 5.- Si-washing with Bull-Block in Highlead

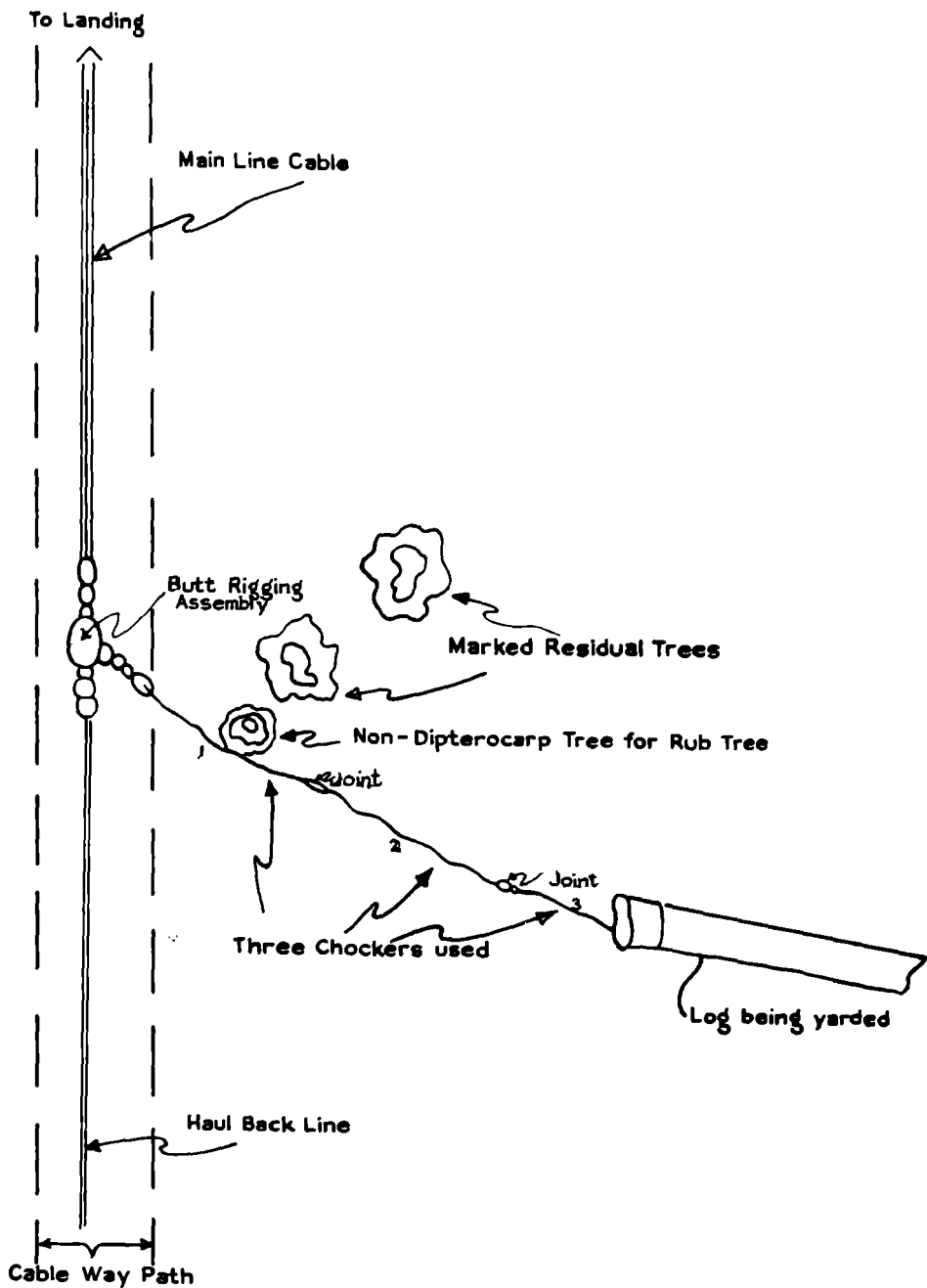
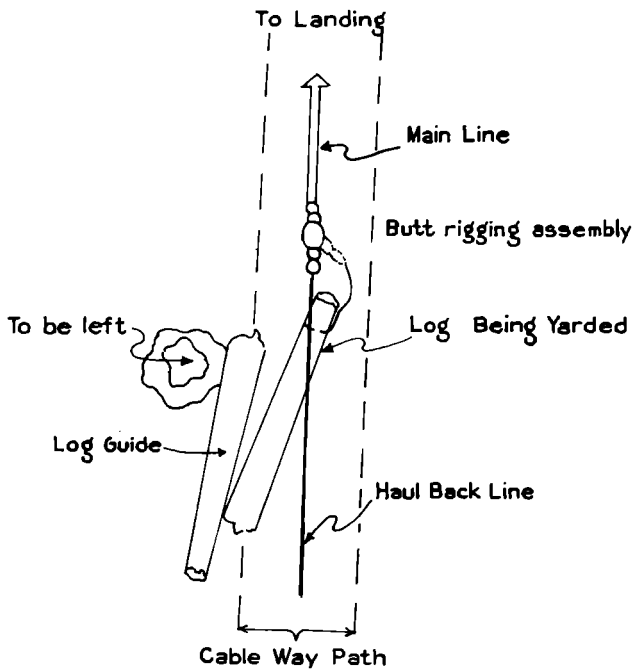


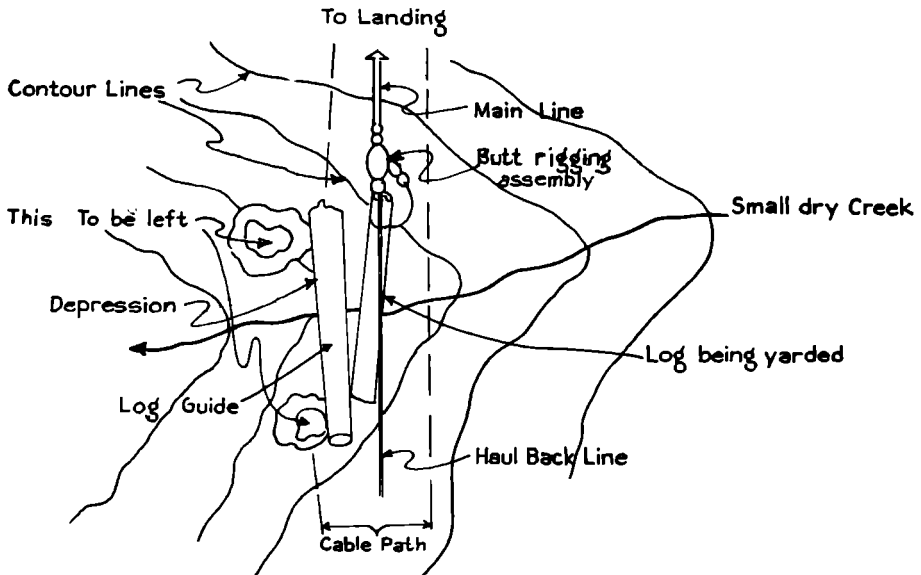
Figure 6.- Illustration showing the use of Extended Chockers.



# Yarding Techniques for Saving Residuals



-A- IN FRONT ON THE CABLE SIDE OF RESIDUAL TREES



-B- ON MODERATE SLOPE NEAR SMALL CREEKS & GULLEYS

Figure 7. - Illustration showing the use of Log Guides on Level and Rolling Areas.

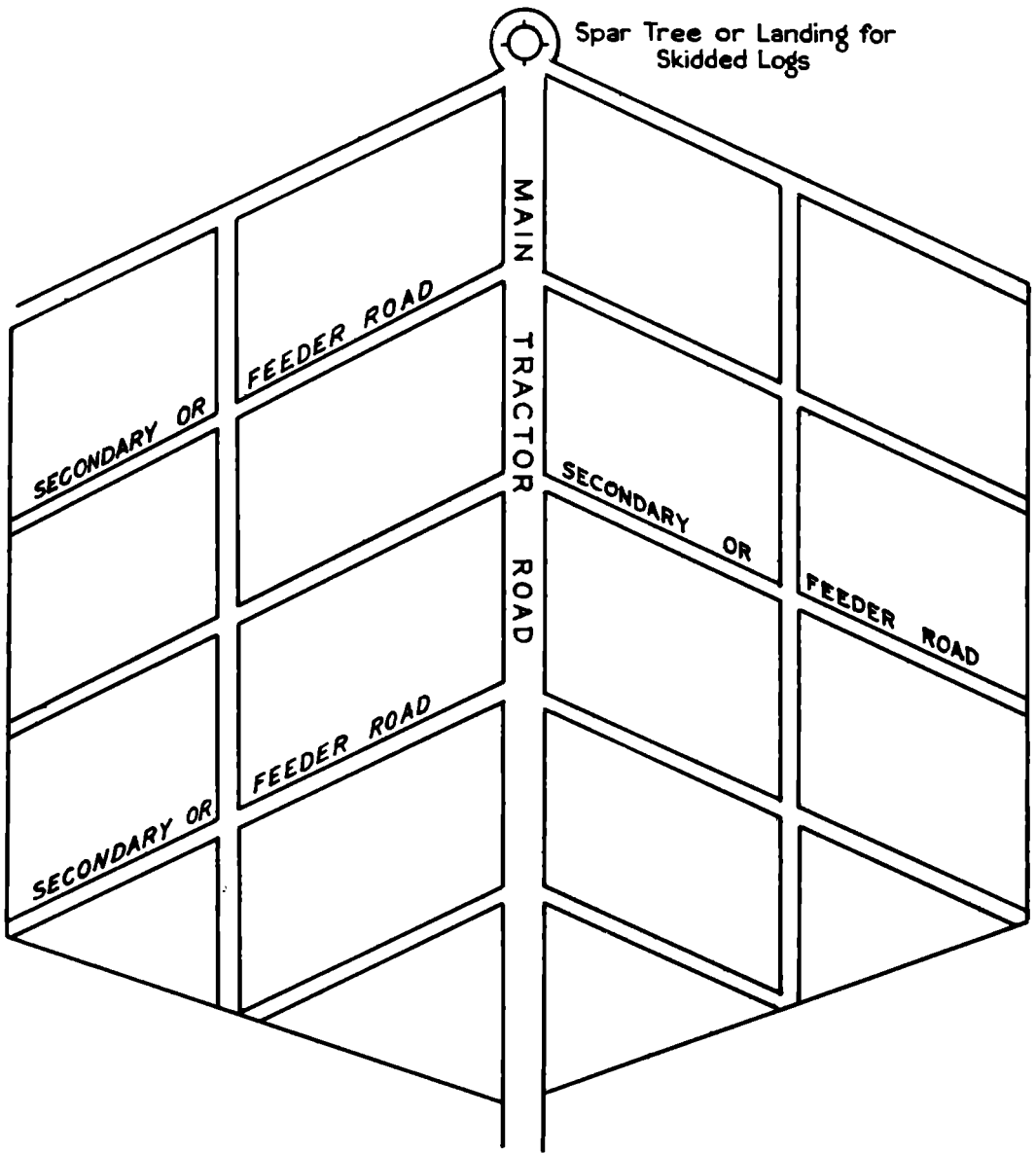


Figure 8.- The "Leaf Vein" or Straight Formation of Tractor Road